Intersection & Resection

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In the distance, Ranger Jones sees the smoke from a fire. He believes it to be an uncontrolled forest fire and wants to locate it for further investigation. All that is needed is a compass and map. (There is no need to make a linear measurement.) How are these instruments used to locate the fire? The explanation may be clearer if you understand the information from a previous article, "Measuring Direction: Azimuth & Bearing" found in the Winter 2003 issue of *Alabama's TREASURED Forests*.)

Intersection

Ranger Jones will use the method of "intersection." While at fire tower A, Jones can see the smoke. He takes a compass reading and determines the smoke is at an azimuth (Az) of 287^{o}or a bearing of N73^{o}W. (see figure 1)

Jones calls fire tower B on the radio and asks them to do the same process. Tower B reports seeing the same smoke and takes a compass reading. That reading is an azimuth of 47^{o} or bearing of N47^{o}E. (see figure 1)

Both towers report their information to the dispatcher. Neither ranger knows how far away the smoke is from their tower. The dispatcher takes a map, locates tower A and from that point draws a line at Az 287^{o} / N73^{o}W. The same process is done for tower B and he determines that direction to be Az 47^{o} / N47^{o}E. He knows the smoke is located somewhere along each of the straight lines reported by the rangers. The only possible place is where the two lines intersect. (see figure 1) This intersection method determined one location from two known locations and two directions.

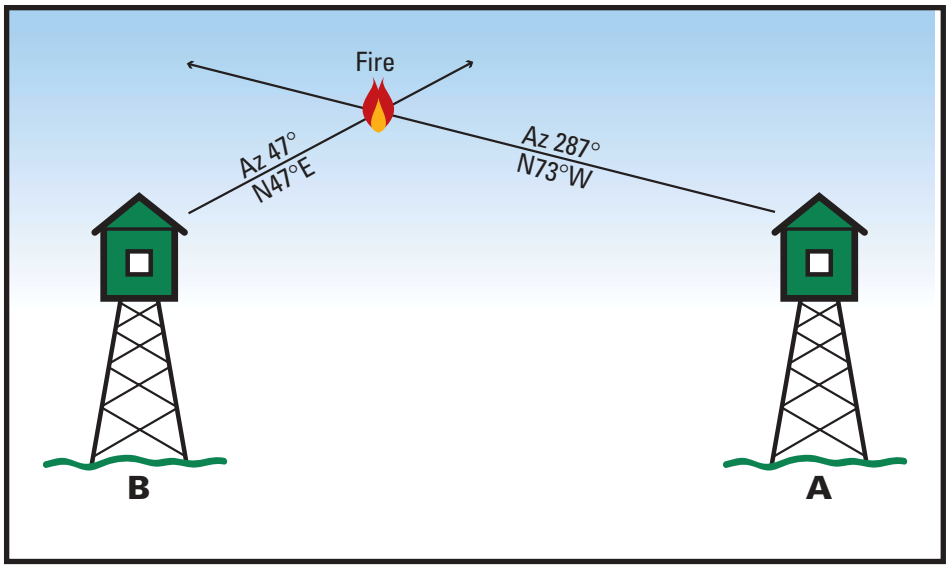

Figure 1 Example of Intersection method.

Of course, Ranger Jones could have done the same thing by being at any known location, measuring the direction, moving to another known location and measuring the direction, then plotting the lines on a map.

Resection

For this scenario, Ranger Jones is in the woods with a map and compass. He is at the fire described above and wants to plot it on a map so that it can be reported accurately. How will he accomplish the task? Jones will apply the technique of "resection." While at the fire location, he can see the two fire towers (A & B). He takes his compass and gets a compass reading from his location to fire tower A of Az 107^{o} / S73^{o}E. He does the same for fire tower B with a reading of Az 227^{o} / S47^{o}W. He gets his map and locates both fire towers.

The next step involves computation. *[Mentally draw a straight line. Assume you are walking along that line, then turn and walk in the opposite direction. You have made a directional turn of 180 degrees. Either end of a line is 180 degrees opposite the other end.]* Knowing this fact, Ranger Jones goes through a similar process, mentally drawing a straight line from the tower to himself. He therefore adds 180 degrees to 107 degrees and gets a reading of Az 287^{o} / N73^{o}W from tower A to his location. (Does that direction look familiar from our intersection problem above?) He uses the same process for the other reading and computes [227 – 180 = 47] or Az 47^{o} / N47^{o}E. (Also sound familiar?)

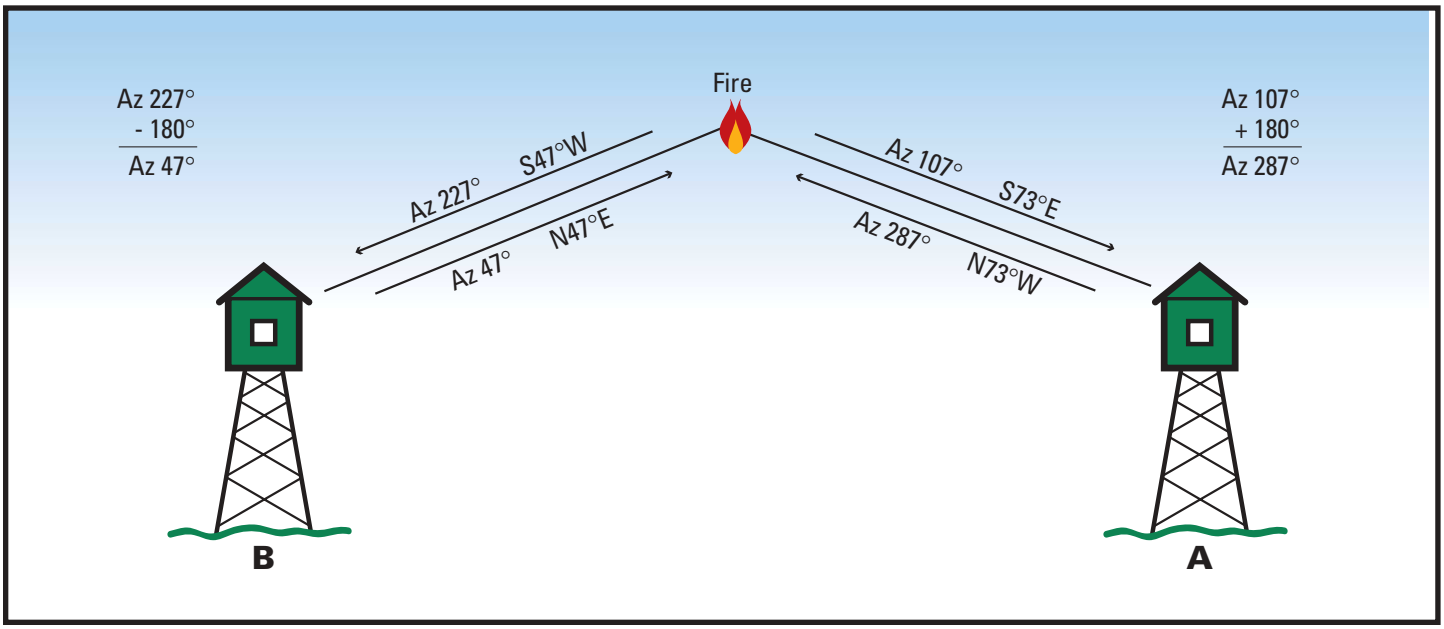

Figure 2 Example of Resection method.

Using these computations, he draws two lines (one from each tower) until they intersect at the location of the fire. The process has now changed from resection to intersection by applying the 180-degree line principle. (See figure 2)

Practice using Section and Resection. Both techniques require some map reading ability, a vantage point to see other places on the map, and knowledge of measuring direction. When you feel comfortable with both of these methods, you may proceed to the next method.

Modified Resection

A "modified resection" occurs when you try to locate your position when you have a general idea of where you are and can see only **one** known point. An example would be when you are on Highway 99, but you don't know exactly where. You see fire tower A and get a compass reading of Az 235^{o} / S55^{o}W. You look on your map and find Highway 99 and tower A. You change your reading by 180 degrees. [235 - 180 = Az 55^{o} / N55^{o}E.] Take your map and draw a line from tower A in the direction of your back azimuth or back bearing. The directional line of Az 55^{o} / N55^{o}E will cross Highway 99 at your exact location. (see figure 3)

Both topographic and county highway maps provide good material for the exercise described above. County highway maps are available from the Alabama Department of Transportation in three scales. Topographic maps are available from a variety of vendors including the federal government.

Take your compass and map, and have some fun. Share your knowledge with a youngster. It will be exciting.

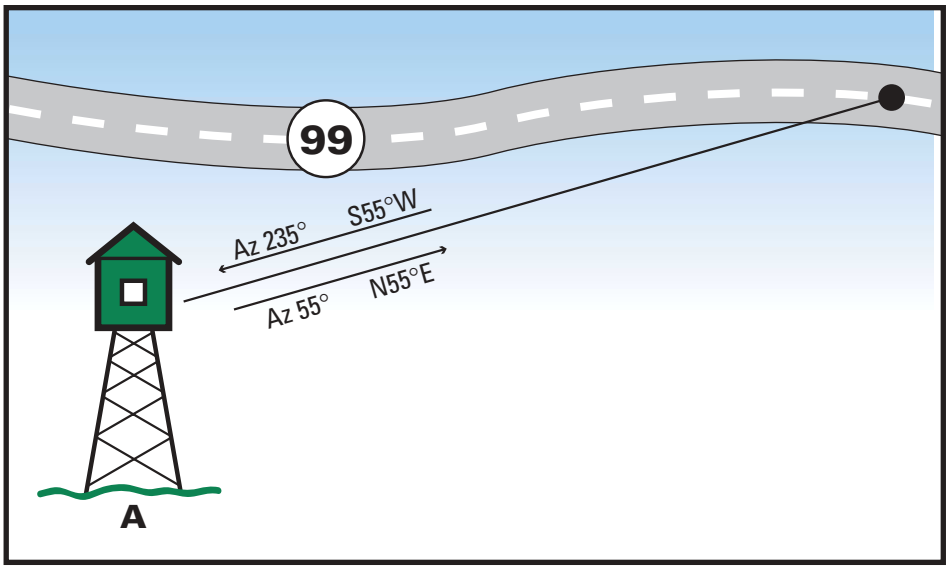

Figure 3 Example of Modified Resection.